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PULSE QUENCHERS FOR STROWGER-TYPE AUTOMATIC TELEPHONE EXCHANGES

Vestnik svyazi [Communications Herald], No 10, October 1955, Moscow, Pages 7-8

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The article discusses the circuits and layout of two-relay and three-relay assemblies of pulse quenchers developed by the Krasnaya zarya Plant for Strowger-type ATS's [automatic telephone exchanges].

Introduction

In Vestnik svyazi No 9, 1953, there appeared an article by candidates in technical sciences V. N. Roginskiy and A. D. Kharkevich on "Mixed Grouping for Step-by-Step ATS's." The authors of this article, in discussing the problem of effective utilization of the capacity of group selectors and the possibility of preserving the numbering in a network in the process of gradual expansion, proposed the use of special assemblies for the "quenching" of unnecessary pulse series.

Pulse series quenching is one of the methods of increasing utilization of the capacity of selectors, and, consequently, of lowering the cost of construction of city telephone networks. This has been the basis for the development of industrial model assemblies of "pulse series quenchers" (GSI) designed for use in the ATS-47.

In replacing the II/IVGI section the pulse quenchers permit reduction of the number of these devices in an automatic exchange. Hence the use of pulse quenchers is convenient only where the cost of producing and operating the GSI is considerably lower than the cost of producing and operating the II/IVGI.

The pulse quencher circuit as given in the article by comrades Roginskiy and Kharkevich is extremely simple and requires but two relays for its construction. The indicated merits of the circuit have permitted its use in the development of industrial models of pulse quenchers. This development was based on the following technical requirements:

1. The purpose of each pulse quencher -- to quench only one series of pulses. Along with this provision must be made for the possibility of quenching several series by a consecutive connection of pulse quenchers; in this case the number of consecutively connected quenchers must correspond to the number of series to be quenched.

2. Connection of the pulse quenchers must not have an adverse effect on the quality of the subsequent pulse series nor on the quality of the speech and the interaction signals transmitted by the ATS equipment.

3. The pulse quencher must be connected directly to the frame of the first pulse quenchers [IGI[or to the incoming end of the junction line leading to the pulse quencher from IGI.

4. The pulse quencher circuit must be so arranged that the GI, LI [line finder], or RSL [junction line relay] may be connected with its output.

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Tests conducted in the process of development showed that it is necessary, without complicating the circuit, to provide stable operation of the pulse quencher upon connecting it to the incoming end of the junction line with the maximum resistance permissible for the ATS-47 system as well as in the case of the minimum permissible duration of the pulse contacts of the digit selector and the maximum permissible negative distortions introduced by the A relay in the IGI circuit. This circumstance led to the necessity of creating two types of pulse quencher circuits, a two-relay circuit (Figure 1) for direct connection of the GSI to the IGI frame, and a three-relay circuit (Figure 2) for connection of the GSI to the incoming end of the junction line.

Pulse Quencher Circuits

Seizure of the selector to the input of which the pulse quencher is connected is achieved by the usual method, since lead c in the GSI assembly makes direct contact.

With the arrival of the series of pulses relay R_1 in the two-relay GSI assembly closes. This relay, being grounded at the release of the armature, holds the latter in the extended position for the duration of the series. The contacts of relay R_1 break the call line, as a result of which the pulse series does not actuate the subsequent selector device. Relay R_2 makes after relay R_1, its open contact breaks the shunt of its second winding, which is connected to lead c.

Upon completion of the series of pulses relay R_1 releases the armature and closes the call line. With the arrival of the next series relay R_1 cannot be made because R_2 is holding its armature in the extended position owing to the passage of current through the winding connected to lead c. As a result of this the circuit of relay R_1 will be opened by the contact of relay R_2.

With the opening of lead c (after clearing at both ends) relay R_2 releases its armature and the GSI circuit is restored to its initial state.

The circuit of the three-relay pulse quencher is basically the same as the circuit of the two-relay quencher. Addition of the third relay arose from the necessity of providing under more difficult operating conditions reliable retention of the relay armature breaking the call line during passage of the pulse series. For this purpose the functions fulfilled by relay R in the two-relay circuit are here fulfilled by two relays. One of them (relay I) is used as a pulse relay; its armature is extended upon the arrival of a series of pulses. The second (relay S) is the series relay. This relay, closed in the local circuit by the closed contact of the pulse relay, holds its armature in the extended position during the passage of the pulse series, since its 65-ohm winding is shunted by the contact of relay I. Relay S closes the circuit of clearing relay O, which in closing cuts off the shunt on its second winding, which is connected to lead c. During the pulse the call line is opened by the contacts of the series relay.

Upon completion of the pulse series relay S releases its armature. Clearing relay O continues to hold its armature in the extended position, preventing the possibility of closing of the pulse relay during dialing of the rest of the number. After the clearing relay closes and the armature of the series relay is released the call lines are connected.

Release of the assembly is achieved upon interruption of lead c (clearing in both directions).

Signalling (Figure 3)

Provision is made on the pulse quencher rack for signalling to indicate the blowing out of rack fuses or of individual fuses and for technical signalling. The latter goes into operation when an undesired polarity appears on the leads to the pulse quencher assembly: plus on lead a in the two-relay and three-relay GSI circuits and minus on lead b in the three-relay GSI circuit. In this case the armature of relay R_1 (or of relay I) in the assembly is extended, the contacts of this relay thereby closing the circuit of relay TS in the signalling circuit. The latter closes and connects time-delay relays N and K. Relay K, closing after a fixed time interval, insures lighting of rack lamp TS and actuation of series and sectional signalling. Lamp TS of the GSI assembly, connected in series with relay TS, cannot light up since insufficient current passes through it.

In order to locate the malfunctioning GSI deck push-button Kn.TS is pressed. Having pressed this button the high-impedance winding (2,000 ohms) of relay TS is shunted by the 15-ohm impedance of the second winding of the same relay and lamp TS of the malfunctioning deck lights up.

GSI Layout

The GSI assemblies are mounted on removable 12-relay decks, each of which holds six two-relay assemblies or four three-relay assemblies.

Design-wise the pulse-quencher rack is a complete unit designed for the installation of 20 decks with two-relay or three-relay assemblies. At the twenty-first operating position of the rack is located a removable signal deck.

On the front of the rack, on the right, there is a strip with 20 individual TS lamps, jacks, a push-button, and a switch Kl.PS. Below this strip are 62 fuses. In the rear of the rack are seven input connectors, designed to accomodate the inter-rack connections. Dimensions of the rack: 2,365 mm high, 400 mm wide. Distance between fastener holes 290 mm.

Tests of experimental models of GSI assemblies, performed with the arrangements shown in Figure 4, demonstrated the stable operation of assemblies of both types and full conformance to their technical requirements. This leads to the conclusion that it is possible to use the developed assemblies under operating conditions in the ATS-47.

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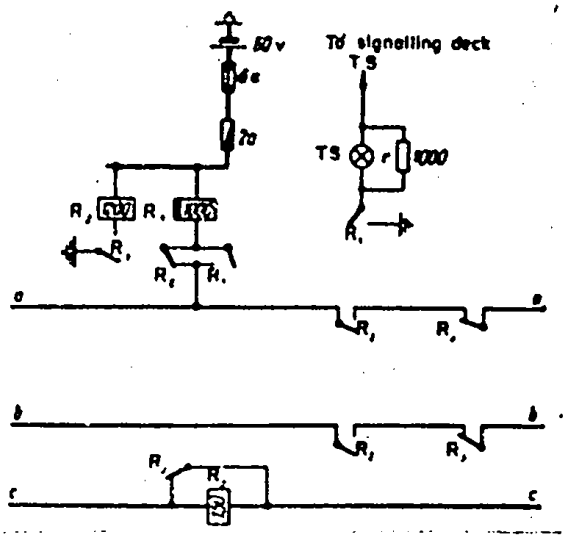
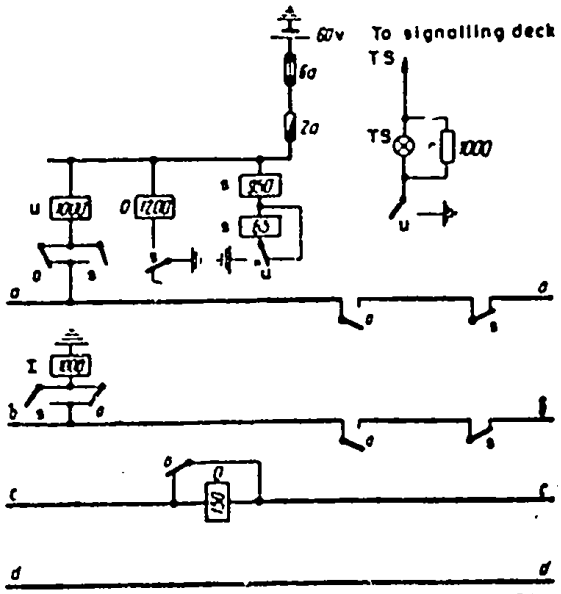


Figure 1



NOTES: 1. Lead d is used in connecting the GSI after the incoming assembly of the two-wire RSL and VK of the intermediate equipment.

2. In operation with the VK of the intermediate equipment leads c and d interchange positions.

Figure 2

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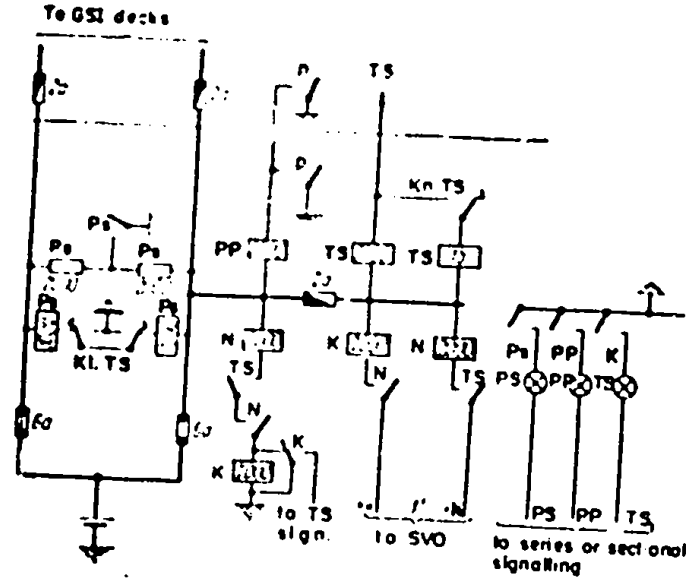

Figure 3

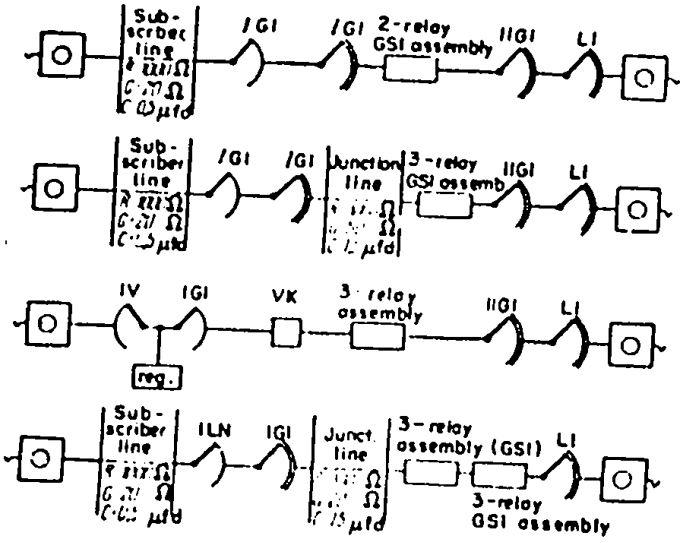

Figure 4

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